REMARKS

Claims 1, 3, and 4 are pending in this application. By the previous Office Action, claims 1 and 3 are rejected under 35 U.S.C. §103. By this Amendment, claim 1 is amended and claim 4 is added. Support for the amendment to claim 1 can be found in the specification as originally filed, such as at paragraphs [0013], [0033], [0039]-[0042], and [0046]. Support for new claim 4 can be found in the specification as originally filed, such as at paragraph [0039]. No new matter is added.

I. Rejections Under §103

Claims 1 and 3 are rejected under 35 U.S.C. §103(a) over Kasai. Claim 1 is rejected under 35 U.S.C. §103(a) over Ota. Claims 1 and 3 are also rejected under 35 U.S.C. §103(a) over Yoshida '118, Kido, or Matsuzawa. Claim 1 is also rejected under 35 U.S.C. §103(a) over Yoshida '976, or Homma. Applicants respectfully traverse these rejections with respect to the amended claims.

A. The Claimed Invention

The claimed invention is directed to a method for polishing a glass hard disk platter, comprising polishing a glass hard disk platter using a stable slurry in which cerium(IV) oxide particles having an average secondary particle size of 0.1 to 0.5 μm are dispersed in water and which contains CeO_2 in a concentration of 0.2 to 30 wt%, wherein a proportion of cerium expressed as a ratio of (cerium oxide)/(cerium oxide + other rare earth oxides) in the cerium(IV) oxide particles is 95% or more based on weight. See claim 1. Claim 1 further specifies that the stable slurry is a slurry of surface-modified cerium(IV) oxide obtained by heat-treating cerium(IV) oxide that is obtained by blowing oxygen or a gas containing oxygen into a suspension obtained by reacting a cerium salt with an alkaline substance, in an aqueous medium in the presence of an ammonium salt having a non-oxidative anionic component. Such a method is nowhere taught or suggested by the numerous cited references.

The claimed invention thus relates to a method for polishing a glass hard platter using a specific surface-modified cerium(IV) oxide. The claimed method provides a good glass hard platter surface having less unevenness due to a chemical/mechanical effect. The claimed method is suitable for uses that require precision polishing. See specification at paragraph [0071].

In addition, the claimed invention enables a polishing speed, and a ratio of polishing speed to average surface roughness, to be increased. This is accomplished by adjusting an abrasive compound such that cerium accounts for 95% or more in terms of oxides of the total amount of rare earth elements in the abrasive compound for polishing the glass disc platter. As a result, the claimed invention allows for improved productivity and reduced cost of the polishing step. See specification at paragraph [0073].

These benefits are specifically disclosed and described in the specification. For example, Table 1 at page 15 of the specification shows the polishing speed and average surface roughness of Examples 1-4 as compared to the Comparative Example 1. In Examples 1-4, where cerium accounts for 95% or more in terms of oxides of the total amount of rare earth elements in the abrasive compound, the abrasive compound provides significantly reduced average surface roughness and increased ratio of polishing speed to average surface roughness, as compared to Comparative Example 1, where cerium accounts for less than 95% in terms of oxides of the total amount of rare earth elements in the abrasive compound. These Examples and Comparative Example demonstrate the unexpected results obtained when the cerium(IV) oxide content is within the claimed range (Examples 1-4) as compared to when the cerium(IV) oxide content is outside of the claimed range (Comparative Example 1).

Still further, claim 1 specifies that the cerium(IV) oxide is specifically a cerium(IV) oxide whose particles have a high hydroxyl group activity on the surface and are produced by oxidizing a hydrolyzate of a cerium salt with oxygen. As a result, many hydroxyl groups (i.e.,

=C-OH) are generated on the surface of the cerium(IV) oxide particles. This is achieved by heat treating in an aqueous medium in the presence of an ammonium salt having a non-oxidative anionic component. The resultant specific cerium(IV) oxide particles provide improved chemical and mechanical effects to a glass hard disk that is to be polished.

These benefits are not taught or suggested by the cited references.

B. Kasai

Kasai discloses a process for producing crystalline ceric oxide particles having a particle diameter of 0.005 to 5 micron, which comprises reacting a cerium (III) salt with an alkaline substance in an $(OH)/(Ce^{3+})$ molar ratio of 3 to 30 in an aqueous medium in an inert gas atmosphere to produce a suspension of cerium (III) hydroxide, and blowing oxygen or a gas containing oxygen into the suspension at a temperature of 10 to 95°C and at an atmospheric pressure. Abstract. Kasai discloses that cerium oxide is used for polishing a silicon oxide film or a semiconductor device, quartz glass for a photomask, quartz crystal such as for a crystal oscillator, and the like.

However, Kasai is distinct from and does not teach or suggest the claimed invention. In particular, Kasai does not teach or suggest that the polishing method is specifically used for polishing a glass hard disk platter.

Nor does Kasai teach or suggest that a proportion of cerium expressed as a ratio of (cerium oxide)/(cerium oxide + other rare earth oxides) in the cerium(IV) oxide particles is 95% or more based on weight. As shown in the Examples and Comparative Example of the instant specification, the ratio of cerium oxide can vary drastically, and thus the claimed ratio is not inherent in the teachings of Kasai. Nor does Kasai teach or suggest the specific claimed cerium(IV) oxide, or the method by which it is made.

In the absence of any express teachings of the claimed ratio or the specific cerium(IV) oxide, Kasai cannot teach or suggest at least this feature of the claimed invention. Kasai does

not teach or suggest that varying this ratio to 95% or more and providing the specific cerium(IV) oxide would have any beneficial effects, and thus it would not have been obvious to modify Kasai to practice the claimed invention.

C. Ota

Ota discloses a process for preparing ceric oxide particles used as an abrasive or polishing material for producing semiconductors or as a UV ray-absorbing material for plastics, glass and the like. The process prepares cerium (IV) oxide particles having a particle size of from 0.03 to 5 microns, which comprises adjusting an aqueous medium containing cerium (IV) hydroxide and a nitrate to a pH of from 8 to 11 with an alkaline substance and heating the aqueous medium at a temperature of from 100° to 200°C under pressure. Abstract. Ota teaches that cerium oxide is used for polishing materials for producing semiconductor devices.

However, Ota would not have rendered obvious the claimed invention. In particular, Ota does not teach or suggest that the polishing method is specifically used for polishing a glass hard disk platter.

Nor does Ota teach or suggest that a proportion of cerium expressed as a ratio of (cerium oxide)/(cerium oxide + other rare earth oxides) in the cerium(IV) oxide particles is 95% or more based on weight. As shown in the Examples and Comparative Example of the instant specification, the ratio of cerium oxide can vary drastically, and thus the claimed ratio is not inherent in the teachings of Ota. Nor does Ota teach or suggest the specific claimed cerium(IV) oxide, or the method by which it is made.

In the absence of any express teachings of the claimed ratio or the specific cerium(IV) oxide, Ota cannot teach or suggest at least these features of the claimed invention. Ota does not teach or suggest that varying this ratio to 95% or more and providing the specific

cerium(IV) oxide would have any beneficial effects, and thus it would not have been obvious to modify Ota to practice the claimed invention.

D. Yoshida '118

Yoshida '118 discloses a cerium oxide abrasive with which the surfaces of substrates such as SiO_2 insulating films can be polished at a high rate without causing scratches. The abrasive comprises a slurry comprising cerium oxide particles whose primary particles have a diameter of from 10 nm to 600 nm and a median diameter of from 30 nm to 250 nm and slurry particles have a median diameter of from 150 nm to 600 nm and a maximum diameter of 3,000 nm or smaller, the cerium oxide particles being dispersed in a medium. Abstract.

However, Yoshida '118 would not have rendered obvious the claimed invention. In particular, Yoshida '118 does not teach or suggest that the polishing method is specifically used for polishing a glass hard disk platter.

Nor does Yoshida '118 teach or suggest that a proportion of cerium expressed as a ratio of (cerium oxide)/(cerium oxide + other rare earth oxides) in the cerium(IV) oxide particles is 95% or more based on weight. Yoshida '118 merely discloses cerium oxide used in glass-surface polishing for photomasks, and entirely fails to teach or suggest the proportion of cerium in the total rare earth elements in an abrasive compound. As shown in the Examples and Comparative Example of the instant specification, the ratio of cerium oxide can vary drastically, and thus the claimed ratio is not inherent in the teachings of Yoshida '118. Nor does Yoshida '118 teach or suggest the specific claimed cerium(IV) oxide, or the method by which it is made.

In the absence of any express teachings of the claimed ratio or the specific cerium(IV) oxide, Yoshida '118 cannot teach or suggest at least these features of the claimed invention. Yoshida '118 does not teach or suggest that varying this ratio to 95% or more and providing

the specific cerium(IV) oxide would have any beneficial effects, and thus it would not have been obvious to modify Yoshida '118 to practice the claimed invention.

E. Kido

Kido discloses a cerium oxide slurry for polishing comprising cerium oxide dispersed in water, wherein the slurry has a conductivity of about 30 c μS/cm or less when the cerium oxide concentration in the slurry is c wt. %. In order to adjust the conductivity to about 30 c μS/cm or less, cerium oxide is washed with deionized water. Abstract. Kido thus discloses cerium oxide used for polishing a glass article such as a photomask or a lens, on an insulating film during a step in the manufacture of a semiconductor device.

Kido discloses that the purity of the cerium oxide itself is preferably 99 mass% or more in order to minimize the contamination with metallic impurity derived from residual cerium oxide abrasive particles after the semiconductor device or the like is polished with a cerium oxide abrasive and washed. Kido teaches that if the conductivity of the slurry exceeds 30 c μS/cm, an ionic substance serving as an impurity covers the surface of the cerium oxide particles, to thereby affect the polishing performance of the cerium oxide particles and lower the polishing rate. Col. 5, lines 8-12.

As described above, the cerium oxide in Kido is used for polishing semiconductor devices. Kido does not teach or suggest that the quality of the polished surface can be improved by selecting the proportion of cerium in the total rare earth elements in an abrasive compound. Kido merely discloses that cerium oxide having a high purity can prevent pollution of polished semiconductor devices.

Further, Kido at least implicitly teaches that the proportion of cerium in the total rare earth elements in an abrasive compound is not relevant or appreciated. For example, the Examples and Comparative Examples of Kido both use cerium oxide of 99.95 mass% purity.

This indicates that Kido did not appreciate the importance of the proportion of cerium in the total rare earth elements in an abrasive compound.

Nor does Kido teach or suggest the specific claimed cerium(IV) oxide, or the method by which it is made. Kido does not teach or suggest that the stable slurry is a slurry of surface-modified cerium(IV) oxide obtained by heat-treating cerium(IV) oxide that is obtained by blowing oxygen or a gas containing oxygen into a suspension obtained by reacting a cerium salt with an alkaline substance, in an aqueous medium in the presence of an ammonium salt having a non-oxidative anionic component, as claimed.

In the absence of any express teaching of the claimed proportion of cerium expressed as a ratio of cerium oxide and other rare earth oxides and the specific cerium(IV) oxide, Kido cannot teach or suggest at least these features of the claimed invention. Kido does not teach or suggest that varying this ratio to 95% or more and providing the specific cerium(IV) oxide would have any beneficial effects, and thus it would not have been obvious to modify Kido to practice the claimed invention.

F. Matsuzawa

Matsuzawa discloses an abrasive containing a slurry of cerium oxide grains dispersed in water. The Cerium oxide grains are obtained by adding hydrogen peroxide to an aqueous dispersion of cerium carbonate. The Cerium oxide grains are obtained by oxidizing a precipitate, which is formed through addition of ammonium hydrogen carbonate to an aqueous solution of cerium nitrate, with hydrogen peroxide. The Cerium oxide grains are obtained by neutralizing or alkallfying an aqueous solution of cerium ammonium nitrate. Abstract. Matsuzawa teaches that cerium oxide is used for polishing a silicon oxide film of a semiconductor device.

However, Matsuzawa would not have rendered obvious the claimed invention. In particular, Matsuzawa does not teach or suggest that the polishing method is specifically used for polishing a glass hard disk platter.

Nor does Matsuzawa teach or suggest that a proportion of cerium expressed as a ratio of (cerium oxide)/(cerium oxide + other rare earth oxides) in the cerium(IV) oxide particles is 95% or more based on weight. As shown in the Examples and Comparative Example of the instant specification, the ratio of cerium oxide can vary drastically, and thus the claimed ratio is not inherent in the teachings of Matsuzawa. Nor does Matsuzawa teach or suggest the specific claimed cerium(IV) oxide, or the method by which it is made.

In the absence of any express teaching of the claimed ratio and the specific cerium(IV) oxide, Matsuzawa cannot teach or suggest at least these features of the claimed invention. Matsuzawa does not teach or suggest that varying this ratio to 95% or more and providing the specific cerium(IV) oxide would have any beneficial effects, and thus it would not have been obvious to modify Matsuzawa to practice the claimed invention.

G. Yoshida '976

Yoshida '976 discloses a manufacturing method for a glass product not having a rotatively symmetric body like an optical fiber fixing member but having a fine structure as of optical fiber engagement portions, to transfer the fine structure with a high precision without creating molding burrs. The method includes the steps of placing a glass material in a cavity defined by a lower mold, an upper mold, and a side mold, molding the glass material in the cavity with pressure into the glass product in so controlling that the glass material has a viscosity range of $10^{6.5}$ to $10^{9.5}$ poises at the beginning of molding operation with pressure, that the lower mold is at a temperature in a range such that the glass material indicates the above viscosity range, and that the upper and side molds are at a temperature in a range such that a converted viscosity of the glass material at the temperature of the upper and side molds

is 5 to 100 times higher than the viscosity of the glass material at the temperature of the lower mold, and decreasing the temperature of the lower mold at the same time that or after the glass product begins to be molded with pressure. To produce an optical fiber fixing member, the lower mold has a mold face for molding optical fiber engagement portions of the optical fiber fixing member; the upper mold has a mold face for molding a bottom of the optical fiber fixing member; and the side mold has a mold face for molding a side face of the optical fiber fixing member Abstract.

Yoshida '976 merely teaches a method for manufacturing a glass product, such as an optical fiber, and does not teach or suggest a method for polishing a glass hard disk platter, as claimed. That is, Yoshida '976 entirely fails to teach or suggest a method for polishing a glass hard disk platter, comprising polishing a glass hard disk platter using a stable slurry in which cerium(IV) oxide particles having an average secondary particle size of 0.1 to 0.5 μm are dispersed in water and which contains CeO_2 in a concentration of 0.2 to 30 wt%, wherein a proportion of cerium expressed as a ratio of (cerium oxide)/(cerium oxide + other rare earth oxides) in the cerium(IV) oxide particles is 95% or more based on weight. Nor does Yoshida '976 teach or suggest the specific claimed cerium(IV) oxide, or the method by which it is made.

Accordingly, Yoshida '976 does not teach or suggest the claimed invention, and would not have rendered obvious the claimed invention.

H. Homma

Homma discloses an organic insulating film polished utilizing a polishing agent containing cerium oxide particles (a ceria slurry). The ceria slurry is composed of cerium oxide powder containing a total concentration of Na, Ca, Fe, and Cr of less than 10 ppm. Fragile inorganic and organic insulating films formed at relatively low temperatures can be polished without degrading characteristics of a semiconductor element having such films

thereon, due to, e.g., Na diffusion. Abstract. Homma thus discloses that cerium oxide is used for polishing an organic insulation film of a semiconductor device.

However, Homma would not have rendered obvious the claimed invention. In particular, Homma does not teach or suggest that the polishing method is specifically used for polishing a glass hard disk platter, as claimed.

Nor does Homma teach or suggest that a proportion of cerium expressed as a ratio of (cerium oxide)/(cerium oxide + other rare earth oxides) in the cerium(IV) oxide particles is 95% or more based on weight. As shown in the Examples and Comparative Example of the instant specification, the ratio of cerium oxide can vary drastically, and thus the claimed ratio is not inherent in the teachings of Homma. Nor does Homma teach or suggest the specific claimed cerium(IV) oxide, or the method by which it is made.

In the absence of any express teaching of the claimed ratio and specific cerium(IV) oxide, Homma cannot teach or suggest at least these features of the claimed invention. Homma does not teach or suggest that varying this ratio to 95% or more and providing the specific cerium(IV) oxide would have any beneficial effects, and thus it would not have been obvious to modify Homma to practice the claimed invention.

I. Conclusion

For at least these reasons, the claimed invention would not have been obvious over the cited references. The references fail at least to teach or suggest the claimed method for polishing a glass hard disk platter. Nor do the references teach or suggest a stable slurry containing cerium(IV) oxide particles wherein a proportion of cerium expressed as a ratio of (cerium oxide)/(cerium oxide + other rare earth oxides) in the cerium(IV) oxide particles is 95% or more based on weight, as claimed. The references also fail to teach or suggest the specific claimed cerium(IV) oxide, or the method by which it is made.

Accordingly, reconsideration and withdrawal of the rejections are respectfully requested.

II. New Claim 4

New claim 4 depends from claim 1, and further recites that the ammonium salt having a non-oxidative anionic component is selected from the group consisting of ammonium carbonate, ammonium hydrogen carbonate, and mixtures thereof. Claim 4 is patentable over the cited references at least for the same reason as claim 1. Furthermore, claim 4 is patentable over the cited references because the cited references also fail to teach or suggest that the ammonium salt having a non-oxidative anionic component is selected from the group consisting of ammonium carbonate, ammonium hydrogen carbonate, and mixtures thereof.

III. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

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